SECTION 2.0

OVERVIEW OF DOCUMENT CONTENTS

This section briefly outlines the nature, extent, and format of the material presented in the remaining sections of this report.

Section 3.0 provides a brief summary of the physical and chemical characteristics of benzene and an overview of its production, uses, and emissions sources. This background section may be useful to someone who needs to develop a general perspective on the nature of benzene, how it is manufactured and consumed, and sources of emissions.

Section 4.0 focuses on the production of benzene and the associated air emissions. For each major production source category described in Section 4.0, an example process description and a flow diagram(s) with potential emission points are given. Available emissions estimates are used to calculate emission factors that show the potential for benzene emissions before and after controls employed by industry. Also provided are estimates of emissions from process vents, equipment leaks, storage tanks, and wastewater. Individual companies that are reported in trade publications to produce benzene are named.

Section 5.0 describes major source categories that use benzene as a feedstock to produce industrial organic chemicals. For each major production process, a description(s) of the process is given along with a process flow diagram(s). Potential emission points are identified on the diagrams and emission ranges are presented, where available. Individual companies that use benzene as a feedstock are reported.

Section 6.0 describes emission sources where benzene is emitted as the by-product of a process (such as petroleum refineries) and post-manufacturing activities where releases from benzene-containing products may occur (such as from gasoline distribution). Example process descriptions and flow diagrams are provided in addition to available emission factors for each major industrial category described in this section.

Section 7.0 presents information on stationary combustion sources (such as municipal waste combustors) and area combustion sources (such as open burning). Example incinerator, furnace, or boiler diagrams are given, when appropriate. Emission factors are also given, when available.

Section 8.0 provides a brief summary on benzene emissions from mobile sources. This section addresses both on-road and off-road sources. Section 9.0 summarizes available procedures for source sampling and analysis of benzene. This section provides an overview of applicable sampling procedures and cites references for those interested in conducting source tests. Section 10.0 presents a list of all the references cited in this document.

Appendix A presents a summary table of the emission factors contained in this document. This table also presents the factor quality rating and the Source Classification Code (SCC) or Area/Mobile Source (AMS) code associated with each emission factor. Appendix B presents a list of all the petroleum refineries in the United States.

Each emission factor listed in Sections 4.0 through 8.0 was assigned an emission factor rating (A, B, C, D, E, or U), based on the criteria for assigning data quality ratings and emission factor ratings as discussed in the document *Procedures for Preparing Emission Factor Documents*.[2] The criteria for assigning the data quality ratings are as follows:

   A - Tests are performed by using an EPA reference test method, or when not applicable, a sound methodology. Tests are reported in enough detail for

adequate validation, and, raw data are provided that can be used to duplicate the emission results presented in the report.

B - Tests are performed by a generally sound methodology, but lacking enough detail for adequate validation. Data are insufficient to completely duplicate the emission result presented in the report.

C - Tests are based on an unproven or new methodology, or are lacking a significant amount of background information.

D - Tests are based on generally unacceptable method, but the method may provide an order-of-magnitude value for the source.

Once the data quality ratings for the source tests had been assigned, these ratings along with the number of source tests available for a given emission point were evaluated. Because of the almost impossible task of assigning a meaningful confidence limit to industry-specific variables (e.g., sample size vs. sample population, industry and facility variability, method of measurement), the use of a statistical confidence interval for establishing a representative emission factor for each source category was not practical. Therefore, some subjective quality rating was necessary. The following emission factor quality ratings were used in the emission factor tables in this document:

A - Excellent. Emission factor is developed primarily from A- and B-rated source test data taken from many randomly chosen facilities in the industry population. The source category population is sufficiently specific to minimize variability.

B - Above average. Emission factor is developed primarily from A- or B-rated test data from a moderate number of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. As with the A rating, the source category population is sufficiently specific to minimize variability.

C - Average. Emission factor is developed primarily from A-, B-, and C-rated test data from a reasonable number of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. As with the A rating, the source category population is sufficiently specific to minimize variability.

D - Below average. Emission factor is developed primarily form A-, B-, and C-rated test data from a small number of facilities, and there may be reason to suspect that these facilities do not represent a random sample of the industry. There also may be evidence of variability within the source population.

E - Poor. Factor is developed from C- rated and D-rated test data from a very few number of facilities, and there may be reasons to suspect that the facilities tested do not represent a random sample of the industry. There also may be evidence of variability within the source category population.

U - Unrated (Only used in the L&E documents). Emission factor is developed from source tests which have not been thoroughly evaluated, research papers, modeling data, or other sources that may lack supporting documentation. The data are not necessarily "poor," but there is not enough information to rate the factors according to the rating protocol.

This document does not contain any discussion of health or other environmental effects of benzene, nor does it include any discussion of ambient air levels.